1. A controllable microscopic bubble nucleation in fluid polymer material production method and its apparatus consisting of an injection or extraction forming mechanism, utilizing gas as a foaming agent, and the said gas can be carbon dioxide, nitrogen, or other gaseous state sources capable of precipitating foam to provide for the microbubble nucleation of polymer material, the microbubble nucleation methods of which are:

a. High pressure gas passes through a gas pipe in a conveyance screw shaft which is indirectly heated utilizing a heater at the outer periphery of a materials pipe;

b. The said high temperature gas enters a microbubble generating component at the front extremity of the said conveyance screw shaft, enabling the gas to be evenly outputted as microscopic bubbles from the inside irregularly arranged microscopic perforations;

c. The said microscopic bubbles at the said sections and the polymer material are blended and transferred by the said conveyance screw shaft to form a uniform, microbubble permeated polymer material;

As a result, the injected or extracted microbubble permeated polymer material consists of simultaneous microscopic bubble generation, blending, and transferring, providing for the rapid and even amalgamation of microscopic bubbles into the polymer material such that when the polymer material is shaped,

it is a uniform, microbubble nucleated polymer material.

2. A controllable microscopic bubble nucleation in fluid polymer material production method and its apparatus consisting of a materials pipe of an injector or an extractor having a heater outside, with a conveyance screw shaft inside the said materials pipe to provide for polymer material melting and conveyance screw shaft transferring, the features of which are:

A gas pipe disposed in the interior section of the said conveyance screw shaft and, furthermore, the said air intake opening is connected to a pressurization pump or a high pressure gas storage tank;

A microbubble generating component that consists of irregularly interconnected microscopic perforations disposed outward from the inside, with the said gas pipe extending into the interior section of the said microbubble generating component;

As a result, the said microscopic bubbles are outputted from inside the irregularly arranged microscopic perforations of the said microbubble generating component and a check valve is not required to block counter flow, thereby simultaneously providing for the microscopic bubble generating, blending, and transferring of the liquid polymer material to achieve the rapid and uniform amalgamation of the microbubbles.

3. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component can be a microscopic perforation vented metal head.

4. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component can be a microscopic perforation vented ceramic head.

5. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said high pressure gas is sourced from the said pressurization pump or the said high pressure gas storage tank

6. As mentioned in Claim 1 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, control over the said high pressure gas conveyance sources permits control of the said microbubble generating component microbubbles such that they are

continuously outputted or intermittently outputted, enabling the liquid polymer material and microscopic bubble generating section to be intermittently amalgamated or continuously amalgamated, thereby providing for an injection or an extraction forming method.

7. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component is capable of providing a microscopic bubble measuring less than 35 microns, enabling polymer material nucleation at less than 35 microns.

8. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component is fabricated as a solid metal component; a gas passage is horizontally disposed through the center that is in continuity with the said gas pipe inside the said conveyance screw shaft 14 and, furthermore, a plurality of vent holes are formed through the periphery of the said solid metal component, the said vent holes are in continuity with the said gas passage and a microscopic perforation vent block is situated in each said vent hole, and the said microscopic perforation vent block also has irregular

microscopic perforations.

9. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component is fabricated as a hollow metal component such that an air chamber is formed in the interior section and, furthermore, a through-hole is disposed in the rear extent of the said hollow metal component which is in continuity with the said gas pipe inside the said conveyance screw shaft and, furthermore, a plurality of vent holes are formed through the periphery of the said hollow metal component, a microscopic perforation vent block is situated in each said vent hole, and the said microscopic perforation vent block also has irregular microscopic perforations.

10. As mentioned in Claim 1 and Claim 2 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component on the said extractor has a flow diverter ring sleeved onto its outer edge and ribs are formed lengthwise along the periphery of the said flow diverter ring such that the height between the outer edges of the said flow diverter ring and the said materials pipe defined by the lengthwise said ribs form a non-microbubble permeated polymer material

channel, while that between the inner edge of the said flow diverter ring and the said microbubble generating component form a microbubble permeated polymer material channel such that the non-microbubble permeated liquid polymer material surrounds the microbubble permeated liquid polymer material.

11. As mentioned in Claim 4, Claim 5, Claim 8, and Claim 9 of the controllable microscopic bubble nucleation in fluid polymer material production method of the invention herein, the said microbubble generating component has selectable microscopic perforation dimensions as well a microscopic perforation vented metal head and microscopic perforation ceramic head options to achieve required microscopic bubble nucleation dimensions.

ABSTRACT

A controllable microscopic bubble nucleation in fluid polymer material